[0018] FIG. **8** shows an illustrative computing device in accordance with various embodiments.

DETAILED DESCRIPTION

[0019] In the following description of various embodiments, reference is made to the accompanying drawings, which form a part hereof, and in which various embodiments are shown by way of illustration. It is to be understood that there are other embodiments and that structural and functional modifications may be made. Embodiments of the present invention may take physical form in certain parts and steps, examples of which will be described in detail in the following description and illustrated in the accompanying drawings that form a part hereof.

[0020] Some wireless technologies, such as radar technologies, have a number of properties and are subject to a number of regulations that make coexistence with other wireless systems a challenge. Radar technologies use radio waves to detect the range, altitude, direction, or speed of objects. Radar is commonly used today in air traffic control and in monitoring meteorological effects, such as precipitation. The performance of radar, however, is sensitive to interference. To lessen the risk of other systems interfering with radar, the FCC has imposed regulations that deny the use of a channel if a radar system is detected as using the channel.

[0021] As a further challenge for coexisting with radar, a radar system may change its operating frequency quite frequently (sometimes referred to as frequency agility). For example, radar systems may operate at any one time at one or more frequencies within one or more narrow operating bands (e.g., a 2 MHz band or a 5 MHz band). The radar system may be configured to change an operating frequency (e.g., every 100 milliseconds or so) to account for undesired effects from potential sources of interference (e.g., environmental factors, jamming sources, and the like). To reduce the chance that secondary devices will interfere with the radar system's operations, it may be important to maintain accurate and up-to-date information about the spectrum usage (also similarly referred to as spectrum occupancy).

[0022] Many embodiments will be described in terms of radar systems coexisting with communication systems. The methods and system architectures described herein may be applied to other combinations of wireless technologies. For example, instead of radar systems, the methods and system architectures described herein may be applied so other frequency agile wireless technologies, such as Bluetooth or Zigbee, may coexist with communications systems at reduced levels of interference.

[0023] FIG. **1** depicts an illustrative example of a system architecture for the coexistence of radar and communication systems. The example depicts a networked environment **100** where two radar systems may coexist with a number of access nodes of a communication system. Dual band radar system **105** and air traffic control radar system **110** are just two examples of the types of radar systems that could be included in a system that shares spectrum with a communication system.

[0024] Access nodes **120**A-**120**H of the communication system may be located at various geographic locations. Each access node may provide one or more communication services to secondary devices, such as computing devices **125**A-**125**D (e.g., smartphone **125**A, cell phone **125**B, tablet computer **125**C, personal computer or laptop computer **125**D). Although computing devices **125**A-**125**D illustrate particular types of devices, any other type of mobile or computing device that is capable of communicating with an access node could be used.

[0025] In some embodiments, access nodes **120**A-**120**H may provide Wi-Fi services or wireless local access network (WLAN) services to computing devices based on an IEEE 802.11 specification. Access nodes **120**A-**120**H may provide services for other types of wireless technologies, such as LTE, Worldwide Interoperability for Microwave Access (WiMAX), Evolved High-Speed Packet Access (HPSA+), or other type of 3^{rd} generation (3G) or 4^{th} generation (4G) wireless technology. The access nodes **120**A-**120**H may, in some embodiments, be base stations for an LTE communications system or access points for a Wi-Fi or WLAN communications system. For example, access nodes **120**A-**120**H may be femto base stations or femtocells. In some arrangements, a femto base station may be configured to wirelessly communicate with one or more secondary devices (e.g., devices **125**A-**125**D) and provide the one or more secondary devices with access to a communication service via a public-switched telephone network.

[0026] As a condition of radar systems coexisting with communication systems, information describing how each radar system is using the spectrum may be maintained by one or more devices throughout the networked environment **100**. Shared spectrum access database **130** is illustrated as being in communication with the radar systems to receive and store records of each radar system's spectrum usage. A radar system's spectrum usage, however, may be considered a trade secret or confidential. Thus, in some embodiments, shared spectrum access database **130** may be a global database that serves as the only point of contact in the network between radar systems and communication systems.

[0027] Shared spectrum access database **130** may communicate with a radar system via an interface device such as, for example, radar operation and access management device **115**A for the dual band radar system **105**A, and radar operation and access management device **115**B for the air traffic control radar system **110**. The interface device may communicate with the radar system to exchange messages related to the radar system's operation (e.g., operation messages) and spectrum usage (e.g., spectrum information messages) and maintain records of the radar system's spectrum usage and operation. Such records may include a record of current operating frequencies (e.g., a record of one or more operating frequencies in the S Band) and/or a record of current narrow operating bands (e.g., a record of one or more 2 MHz-wide or 5 MHz-wide operating bands in the S Band). The interface device may from time to time transmit information describing the radar system's spectrum usage (e.g., radar usage information) to the shared spectrum access database **130**. For example, the interface may transmit radar usage information periodically or on an as-needed basis (e.g., whenever the radar system changes an operating frequency). The interface device may send the radar usage information on a frequent basis due in part to some radar systems having the ability to switch operating frequencies frequently (e.g., every 100 milliseconds).

[0028] In addition to the shared spectrum access database **130**, networked environment **100** of FIG. **1** includes a number of shared access controllers **135**A-**135**C. Each shared access controller **135**A-**135**C may include a database for storing information received from a shared spectrum access database and/or one or more access nodes. The shared spectrum access